INVESTOR TRIP - TEXAS CITY

GROWTH IN HYDROGEN

Becoming The Investment In Industrial Gases, Surface Technologies, and Services

November 22, 2002

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Forward Looking Statements

The forward-looking statements in this presentation concerning revenue, earnings, return on capital, volume, growth, economic growth rates, stock price performance, and the value of future product and service offerings involve risks and uncertainties, and are subject to change based on various important factors. These include the impact of changes in worldwide and national economies, availability and cost of power and other energy materials and the ability to recover these costs, pricing fluctuations in foreign currencies, changes in interest rates, the continued timely development and acceptance of new products and processes, the impact of technologies, competitive products and pricing, and the impact of tax and other legislation and regulation in the jurisdictions in which the company operates.
Global Purchased Hydrogen Market

2001 Global Volume: 2,300 MMSCFD

End-Use

- Refining 65%
- Chemical 25%
- Other 10%

Geography

- North Am. 71%
- Europe 19%
- Asia 4%
- Other 6%

Refinery and Chemical Users in North America and Europe are the Major Purchasers of Hydrogen

Source: SRI International
Global Hydrogen Demand is Expected to Grow 10-15% 

Refining Growth
- Heavy/Sour Crudes
- Refinery Operations & Conversion Capacity
- Environmental Regulations for Gasoline & Diesel
- Outsourcing Production

USA - 15-20%
- 2004 - 30 ppm Sulfur in Gas.
- 2006 - 15 ppm Sulfur in Diesel

Europe - 15-20%
- 2005 - 50 ppm Sulfur in Diesel
- 2008 - 10 ppm Sulfur in Diesel

Chemicals Growth
- USA & Europe Flat
- ASIA Grassroots Projects

*Source: SRI International
Praxair Global HYCO Business Growth Driven By Refineries

**2001**
- $525 MM USD*

**2006E**
- $900 MM USD**

- Refining: 45%
- Chemicals: 37%
- Other: 18%

- Refining: 65%
- Chemicals: 22%
- Other: 13%

*Average natural gas price $4.69/mmbtu
**Assumes constant natural gas pricing
Hydrogen Production Methods

Natural Gas → Steam Methane Reformer → Hydrogen for Refining
◆ Maximum H₂/CO/Steam Efficiency
◆ Large Scale CAPEX Efficiency

Hydrocarbon → Partial Oxidation Reaction → CO & H₂ for Chemicals
◆ Hydrocarbon Feedstock Flexibility
◆ O₂ Supply/Cost is Critical

Crude Hydrogen → Pressure Swing Adsorption → H₂ Purification from Multiple Sources
◆ Maximum CAPEX Efficiency
◆ Benefits from Higher Partial Pressure
Key Praxair Hydrogen Facilities

Canada
California
U.S. Gulf Coast
Chicago
Pittsburgh
Spain
Italy
China - Caojing (2005)

SMR - 23
PSA - 31
POX - 2
Pipeline Systems - 7

2001 Global Hydrogen Production 550 MMSCFD
Key Success Factors

♦ Strong Customer Growth – Positioned for Future Sales

♦ Invest Early in Targeted Growth Areas – And Wisely

♦ Pipeline Infrastructure
  • Reliability and Flexibility of Supply
  • Staged Investment Strategy

♦ Polyproduction Economics
  H₂, CO, CO₂, and Steam Sales
## Investment Choices

<table>
<thead>
<tr>
<th>Commercial Options</th>
<th>Enclave</th>
<th>No Infrastructure</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Base Plus Supplemental Needs Flexible Terms</td>
<td>Total Off Take Sole Customer</td>
</tr>
<tr>
<td>Customer Diversification</td>
<td>Multiple</td>
<td>One</td>
</tr>
<tr>
<td>Reliability</td>
<td>Best</td>
<td>Good</td>
</tr>
<tr>
<td>Supply Flexibility</td>
<td>Base/Spot/Supplemental</td>
<td>Requires Stable Load</td>
</tr>
<tr>
<td>CAPEX (100MMSCFD)</td>
<td>$60-70MM</td>
<td>$80-100MM</td>
</tr>
<tr>
<td>Capex/Sales</td>
<td>0.8</td>
<td>1.3</td>
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</tbody>
</table>

**Customer Value is Enhanced Through Investment & Operational Advantage**
Caojing China Petrochemical Complex

- Designated Investment Area by SINOPEC & Government Planning
- 2005 Start-ups of Multiple Integrated Petrochemicals Facilities
- Praxair/Air Liquide 50/50 Joint Venture

**Shared Risk and Capital Investment**

**Global Customers** | **Processes** | **Investment**
---|---|---
BP/SECCO | Ethylene, Polyethylene, ACN | $1500 MM USD
BASF | Poly THF | $250 MM USD
BASF/Huntsman | MDI/MDI | $1000 MM USD
Local Chinese | VCM | $250 MM USD
North American Key Drivers for Hydrogen Growth

♦ Crude Oil Supply Heavier/More Sour
♦ Crude Refining Capacity will Increase +20% by 2015*
♦ Over the Fence Supply
♦ Environmental Regulations will Require Clean Fuels
  • Gasoline Specifications 30ppm of Sulfur by 2004
  • Methyl Tertiary Butyl Ether Replacement Mandated by 2004
  • Diesel Fuel Specification 15ppm of Sulfur by 2006

*Source: Purvin & Gertz

North American Refiners in the US Gulf Coast Will Use Significantly More Hydrogen
Praxair Gulf Coast: Growing Hydrogen Use in Gasoline and Diesel Production

Hydrogen Used Per Barrel of Oil (Standard Cubic Feet)

2001: 480 SCF/BBL

2006: 645 SCF/BBL

2006 Diesel Fuel
Ultra Low Sulfur Rules

2004 Tier 2 Gasoline Rules
High Sulfur Crude
Base Demand

Source: Praxair Estimate

Praxair Gulf Coast Refinery Customers

<table>
<thead>
<tr>
<th>Year</th>
<th>MM SCF/DAY</th>
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<tbody>
<tr>
<td>2001</td>
<td>265</td>
</tr>
<tr>
<td>2006</td>
<td>610</td>
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</table>

2001 18% CAGR
Praxair US Gulf Coast HYCO Growth

<table>
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<tr>
<th></th>
<th>1989</th>
<th>1995</th>
<th>2001</th>
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<tbody>
<tr>
<td>Sales</td>
<td>$15 MM</td>
<td>$100 MM</td>
<td>$310MM</td>
</tr>
<tr>
<td>Customers</td>
<td>10</td>
<td>20</td>
<td>45</td>
</tr>
<tr>
<td>P/L Miles</td>
<td>30</td>
<td>110</td>
<td>310</td>
</tr>
<tr>
<td>H2 MMSCFD</td>
<td>45</td>
<td>150</td>
<td>265</td>
</tr>
<tr>
<td>Investment</td>
<td>$55MM</td>
<td>$110MM</td>
<td>$290MM</td>
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2001 Supply Mode
- SMR: 48
- POX: 34
- Recovery: 13
- Purchase: 5
(map available upon request)
Gulf Coast Customers Are Complex

Petroleum Administration for Defense Districts (PADD) Regions

![Map of PADD regions]

Gulf Coast Customers are the Largest and Most Complex

Maximum Hydrogen Intensity

*Equivalent Distillation Capacity “EDC”*
Praxair Gulf Coast Customers are the Most Hydrogen Intensive

![Graph showing EDC MBPD for different companies]

<table>
<thead>
<tr>
<th>EDC MBPD</th>
</tr>
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<tbody>
<tr>
<td>47,233</td>
</tr>
</tbody>
</table>

**Praxair Customers in PADD3**

<table>
<thead>
<tr>
<th>EDC</th>
<th>% of PADD 3</th>
<th>% of US</th>
</tr>
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<tbody>
<tr>
<td>47,233 MBPD</td>
<td>61.10%</td>
<td>30.90%</td>
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</table>

*Equivalent Distillation Capacity “EDC”*
Praxair Strong Number One Position

Texas City to Lake Charles (3.8 MMBPD)

<table>
<thead>
<tr>
<th>Praxair H2</th>
<th>Competitive H2</th>
</tr>
</thead>
<tbody>
<tr>
<td>Connect</td>
<td>Connect</td>
</tr>
<tr>
<td>86%</td>
<td>37%</td>
</tr>
<tr>
<td>Primary Supplier</td>
<td>Primary Supplier</td>
</tr>
<tr>
<td>55%</td>
<td>18%</td>
</tr>
</tbody>
</table>

(map available upon request)

Praxair has Won Over 80% of the New Hydrogen Supply Awarded in this Area in the Last Year
Praxair Gulf Coast Hydrogen Growth

300 MMSCFD Signed - 200 MMSCFD Anticipated
Texas City Complex

Praxair

S & L
Cogeneration

Natural Gas

Air

Air

Separation

Nitrogen

Oxygen

HP Steam

Electric Power

Pipeline

Sterling Chemicals

Chemical Operations

Products

T & P
Syngas
Gasification

Natural Gas

Air

Cooling Water

Electric Power

Boiler Feed Water

Hydrogen

Pipeline

Carbon Monoxide

H₂/CO Mixture

Cooling Water

Electric Power

Boiler Feed Water

Hydrogen
Texas City, TX - 64 MMSCFD H₂/CO Facility

- Hydrogen Product to Praxair P/L
- CO Product to Sterling Chemical
- Blend Gas Product to Sterling Chemical
- CO₂ Export Steam to Sterling Chemical
- Oxygen Export Steam to Sterling Chemical
- Natural Gas T&P Syngas Supply
- Gasifier
- Syngas Cooler
- Process Cooler
- Absorber
- Stripper
- Water
- PSA Tail Gas Compressor
- PSA Vessels
- Surge Tank
- Dryer
- MDEA Unit

Praxair

Hydrogen Product to Sterling Chemical

CO Product to Sterling Chemical

Blend Gas Product to Sterling Chemical

Export Steam to Sterling Chemical

CO₂

Natural Gas

Oxygen

T&P Syngas Supply

Gasifier

Syngas Cooler

Process Cooler

Absorber

Stripper

Water
Texas City, TX - 64 MMSCFD H₂/CO Facility